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The Jack Pine Budworm

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The jack pine budworm (*Choristoneura pinus* Freeman) is a native insect. Considered for more than 30 years as a racial form of the spruce budworm, this insect was described as a distinct species only recently, in 1953. In 1922, empty chrysalides, very probably of this insect, were collected in northwestern Wisconsin. Heavy defoliation of jack pine was first reported in 1923 in Hubbard County, Minn. Since that time so many outbreaks have developed periodically in various localities throughout the Lake States that this budworm is presently considered to be one of the most important pests of jack pine in the region (fig. 1). By 1946 it was recognized as a serious enemy of jack pine in Ontario, and it has now become a perennial problem in the northwestern part of that Province and in Manitoba.

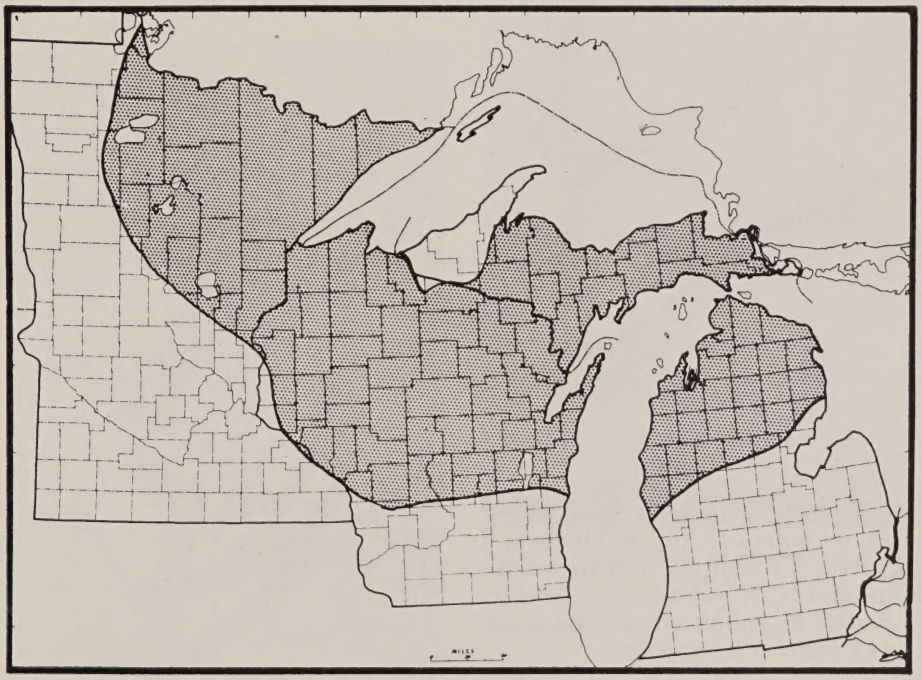

Figure 1.—Distribution of jack pine budworm in the Lake States.

[1] Maintained by the U. S. Department of Agriculture, Forest Service, in cooperation with the University of Minnesota, St. Paul Campus, St. Paul 1, Minn.

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Host Trees

Since eggs have been found only on jack pine, it is believed that the moths will not lay their eggs on any other species. However, caterpillars that drop from the overtopping jack pines feed and develop successfully on understory Scotch and red pines, as well as on white pine, balsam fir, and the spruces.

Evidence of Infestation

The jack pine budworms are wasteful feeders. Generally they clip the needles at the base and web them together, but they do not consume the entire needles (fig. 2).

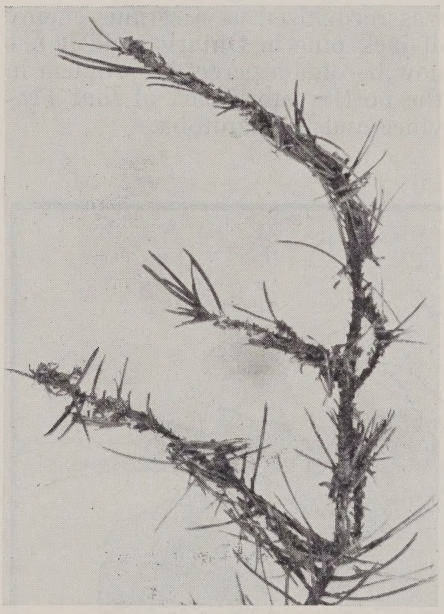

Figure 2.—Feeding damage by jack pine budworms.

As a result, parts of the chewed needles remain in the webbing and turn red. When the budworms are abundant, this indication of feeding is very noticeable, but after several heavy rains it disappears.

Description

The wingspread of a jack pine budworm moth is about three-fourths of an inch. Both the thorax and forewings are reddish brown, and the forewings have silvery white spots. When the adult is at rest, the wings lie tentlike over the body. The eggs are light green and are laid as a cluster in two overlapping rows on the needles; the clusters average about 40 eggs. The body of the second-stage caterpillar is yellowish orange, the head capsule blackish brown, and the shield behind the head pale brown.

The last-stage larva is about seven-eighths of an inch long. Its head is usually brownish yellow with dark brown markings at the side; the shield behind the head is usually dark brown to almost black. The body is dark brown with brownish-yellow areas around the spiracles, the true legs are dark brown, and the abdominal legs light brown.

The pupa is generally reddish brown to yellow with no more than a faint pigmentation (fig. 3).

Figure 3.—Full-grown caterpillar and pupa of jack pine budworm.

Life Cycle

The winter is spent as nonfeeding second-instar caterpillars in silken cases, called hibernacula. These cases are spun in old staminate flower bracts, under bark scales on the trunk and larger limbs, or between the needles. In the spring, the caterpillars emerge and feed for about 6 weeks. During this time the larvae go through 5 additional instars, in contrast to 4 for the spruce budworm.

Depending on locality and weather, pupation begins from late June to late July, the chrysalides usually being formed among the needles or between the webbed shoots. The moths issue from early July to early August. The females have a potential production of about 150 eggs. Hatching occurs about 2 weeks after the eggs are laid, and a few days later, without feeding, the first-stage caterpillars spin their hibernacula, molt to the next stage, and hibernate.

Feeding Habits

The second-instar caterpillars emerge from their hibernacula in the spring about the time the staminate flowers open, and begin to feed on the pollen, their chief food. Although some remain in the flower clusters throughout the entire feeding period, most of them migrate to the new foliage after the pollen has ripened. In this way they differ from young spruce budworms that mine the old needles and feed in the developing vegetative buds as well as in the flower clusters. The larvae eat the new foliage after it is well developed; noticeable feeding on the old foliage occurs only when populations of larvae are very heavy.

Damage Caused

Budworm feeding does not normally cause heavy mortality of merchantable jack pine; the damage usually occurs as top-killing, and the trees become stag headed (fig. 4). In heavy infestations, such as occurred in Lower Michigan from 1949 to 1953, heavy losses in poles, saplings, and reproduction may result. The rate of tree growth is definitely reduced after several years of heavy defoliation, and some loss in wood volume results.

Damage to red pine and white pine, as previously mentioned, occurs in understory trees; at times small trees are completely defoliated and die from the effects of the feeding. Defoliation can also be an important factor in the final decadence of drought-weakened trees. Similarly, severe defoliation has caused heavy mortality to stands on rocky outcrops.

Figure 4.—Top-killing of open-growing jack pine.

Control

Forest management offers the best means for preventing damage by the jack pine budworm because injurious populations appear to be dependent upon an abundance of staminate flowers, which are pro-

duced most commonly on trees that are "orchard" type, coarsely branched and large crowned, or suppressed and slow growing.

Therefore, cutting practices designed to remove these trees should do much to prevent buildup of budworm populations and should also foster more desirable forest conditions. It should be kept in mind that suppressed jack pine does not respond to release and very often dies from sudden exposure. Trees in well-stocked, vigorous stands may bear flowers in sufficient numbers to maintain a noticeable population of caterpillars, but as a rule feeding is light and control measures are not needed.

Many species of parasites attack the jack pine budworm in its various stages. Studies of heavy infestations in Lower Michigan showed that parasitism of the overwintering caterpillars by *Apanteles fumiferanae* Vier. averaged about 22 percent in 1951, 7 percent in 1952, and 10 percent in 1953. Parasitism of mature larvae by *Lypha setafacies* (West.) for the same years averaged about 3, 5, and 4 percent, respectively. The most abundant species reared from the pupae was *Itoplectis conquisitor* (Say) with averages of 28 percent for 1951, 15 percent for 1952, and 11 percent for 1953.

It is therefore important to determine the effectiveness of the parasites before considering chemical control of the jack pine budworm. In the Lake States parasites may be very important in the natural decline of an infestation within 3 to 4 years after heavy defoliation occurs. Rapid declines in population of the jack pine budworm also have been attributed to decreased numbers of staminate flowers.

Although forest management offers the best means of preventing damage and biological factors may at times prove effective in controlling infestations, artificial measures may sometimes be advisable. Control may be brought about when most of the caterpillars are in the fifth and sixth stages by applying, at the rate of 1 gallon per acre, an aerial spray of a DDT-oil solution containing 12½ percent of DDT. Either of two solutions may be used: (1) 1 pound of technical grade DDT in 1¼ quarts of auxiliary solvent (Sovacide PB544C or equal) to which is added 2⅝ quarts of No. 2 fuel oil, or (2) 2 quarts of 25 percent DDT concentrate to which is added 2 quarts of No. 2 fuel oil.

Caution: DDT is poisonous. Store it in a plainly labeled container away from all food products. In handling this chemical follow directions and heed precautions given on the container. In forest spraying, avoid overdosing, especially in the vicinity of streams and over ponds and lakes.

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